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(54) Title of the Invention: CHEMICAL SPRAYING MACHINE

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Detailed Description

[Title of the Invention]

CHEMICAL SPRAYING MACHINE

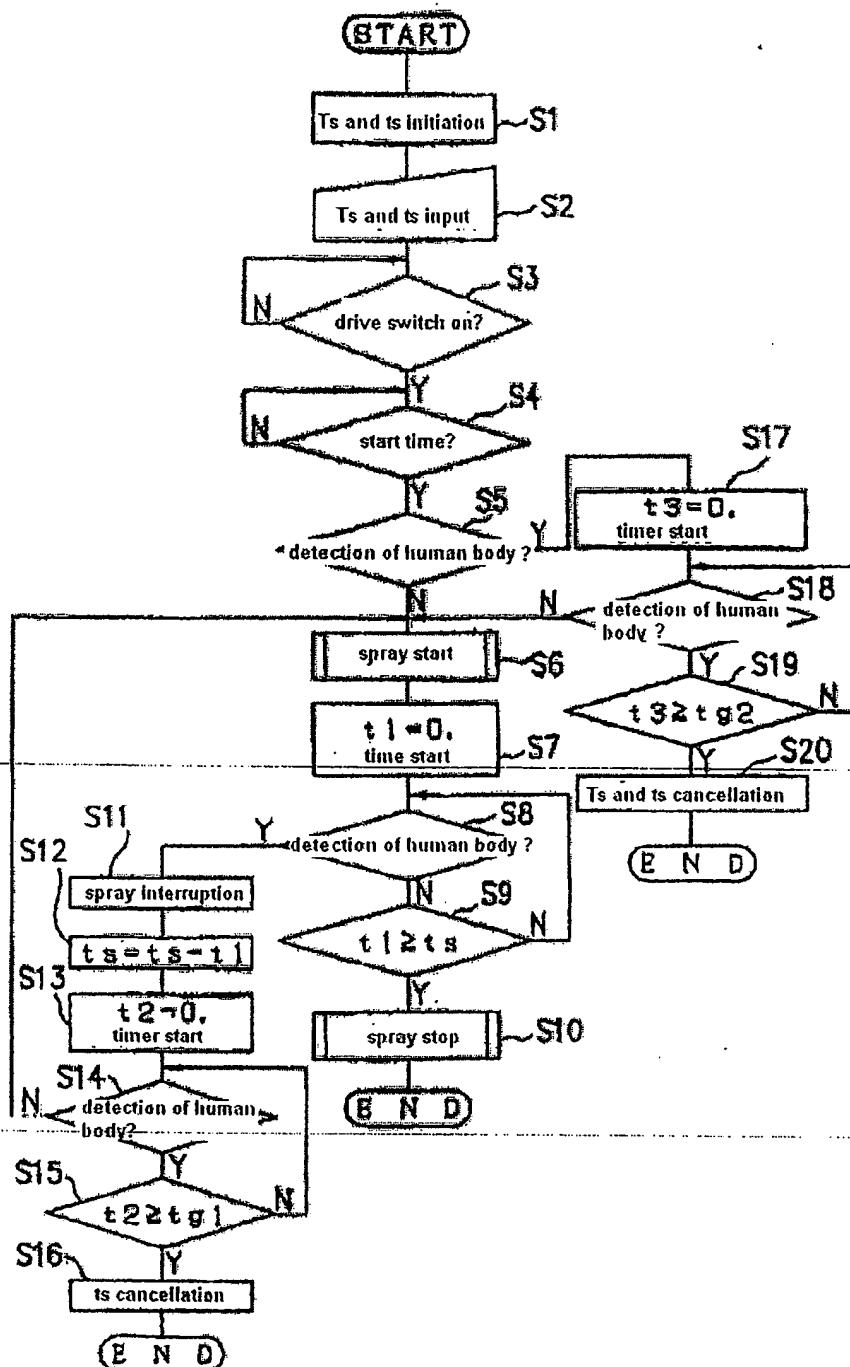
(57) [Abstract]

[Purpose]

To provide a chemical spraying machine with improved safety

[Constitution]

At the predetermined time for starting the spraying, if presence of a human body is detected by a human body detecting means, the start of spraying can be delayed by a spray delaying means until absence of human body is detected. Accordingly, high safety can be assured for a third person, etc. mistakenly intruding into spraying area at the start of spraying, and, after retreat of the third person, etc., expected chemical spraying can be executed.



[Patent Claims]

[Claim 1]

A chemical spraying machine comprising a spraying means that can sprinkle a chemical by spraying, etc., a time setting means for setting up spraying start time and period of spraying time, and a spraying control means that operates the spraying means on the basis of set time and period of time, which is characterized by provision of a human body detection means detecting presence or absence of human body within the spraying area and a spray delaying means delaying start of spraying when at the time for starting the spraying the presence of human body is detected by the human body detecting means until absence of human body is detected.

[Claim 2]

The chemical spraying machine described under Claim 1, characterized by provision of a spray stopping means that stops spraying when the presence of a human body is detected by the human body detecting means during spraying until absence of human body is detected, and a spray resuming means that operates the spraying means only for the time remaining at the stopping of spraying after absence of human body is detected.

[Claim 3]

The chemical spraying machine described under Claim 1 or 2, characterized by provision of a counting means that counts the delay time, and a canceling means that cancels the set time and period of time if the delay time exceeds a predetermined value.

[Claim 4]

The chemical spraying machine described under Claim 2 or 3, characterized by provision of a second counting means that counts time of stopping, and a second canceling means that cancels the set time if the time of stopping exceeds a predetermined value.

[Detailed Description of the Invention]

[0001]

[Field in the Industrial]

The present invention is related to a chemical spraying machine that sprinkles chemicals harmful to the human body in the absence of any human body.

[0002]

[Prior Art]

Spraying is usually performed in the absence of a human body with chemicals such as insecticides with an insect-killing activity and disinfectants with an antibacterial activity since they contain substances harmful to the human body. A chemical spraying machine for spraying such a chemical comprises a spraying means for sprinkling chemical by spraying, etc., a time setting means for setting the spray starting time and spraying time period, and a control means that operates the spraying means on the basis of set time and period of time. It is used to spray chemicals in an area to be sprayer, such as a kitchen, living room, etc., in the absence of a human body from a pre-determined time over a predetermined period of time only.

[0003]

[Problem(s) to be Solved by the Invention]

However, the above-mentioned conventional chemical spraying machine cannot stop chemical spraying even if a third person, etc. mistakenly intrudes into the spraying area at the start of spraying or during the spraying. Accordingly, the danger of inhaling the chemical is very high.

[0004]

The present invention was achieved based on the above background. The purpose is to provide a chemical spraying machine with improved safety.

[0005]

[Means for Solving the Problem]

In order to attain the above-mentioned purpose, according to Claim 1, with the chemical spraying means comprising a spraying means that can sprinkle a chemical by spraying, etc., a time setting means for setting the spraying start time and period of spraying time, and a spraying control means that operates the spraying means on the basis of the set time and period of time, a human body detection means detecting presence or absence of a human body within the spraying area and a spray delaying means, delaying the start of spraying when at the time for starting the spraying the presence of human body is detected by the human body detecting means until the absence of the human body is detected, are provided.

[0006]

According to Claim 2, with the chemical spraying machine described under Claim 1, a spray stopping means that stops the spraying when the presence of a human body is detected by

the human body detecting means during spraying, until absence of the human body is detected, and a spray resuming means that operates the spraying means only for the time remaining at the stopping of spraying after absence of human body is detected, are provided.

[0007]

According to Claim 3, with the chemical spraying machine described under Claim 1 or 2, a counting means that counts delayed time, and a canceling means that cancels the set time and period of time if the delayed time exceeds a predetermined value, are provided.

[0008]

According to Claim 4, with the chemical spraying machine described under Claim 2 or 3, a second counting means that counts the time of stopping, and a second canceling means that cancels the set time if the time of stopping exceeds a predetermined value, are provided.

[0009]

[Functions]

With the chemical spraying machine of Claim 1, the spraying means is operated by the spraying control means at the spray starting time that was set with the time setting means. A chemical is sprayed in the spray area only for the set period of time in the absence of a human body. When a human body is detected by the human body detecting means at the spray starting time, the operation of the spraying means is delayed by the spray delaying means until absence of any human body is detected.

[0010]

With the chemical spraying machine of Claim 2, if the presence of a human body is detected with the human body detecting means during spraying, the spraying is stopped temporarily by the spray stopping means until the absence of any human body is detected. After the absence of human body is detected, the spraying means is operated by the spray resuming means only for the time remaining at the time the spraying was stopped. Other functions are the same as under Claim 1.

[0011]

With the chemical spraying machine of Claim 3, if the delay time counted with the counting means exceeds a predetermined value, the set time and period of time are canceled by the canceling means to stop the spraying. Other functions are the same as under Claim 1 or 2.

[0012]

With the chemical spraying machine of Claim 4, if the temporary stopping time counted with the counting means exceeds a predetermined value, the time set by the canceling means is canceled to prevent resumption. Other functions are the same as under Claim 2 or 3.

[0013]

[Practical Example]

Figure 1 through Figure 4 show an example of the chemical spraying machine of the present invention with a two-fluid type spraying mechanism. Figure 1 shows a cross-sectional schematic diagram of the chemical spraying machine, while Figure 2 shows the constitution of the spraying mechanism. Figure 3 shows a block diagram of the electric circuit, while Figure 4 shows a flow chart of spraying control.

[0014]

First, the mechanical configuration is explained with reference to Figure 1 and Figure 2. In the drawings, 1 is the main body case; 2 is a motor with decelerator; 3 is a covering part; 4 is a supporting part; 5 is a first tank; 6 is a liquid supply tubing; 7 is an electromagnetic pump; 8 is a second tank; 9 is a liquid absorption tubing; 10 is a control box with a built-in circuit board; 11 is a carburetor; 12 is an obstructing part; and 13 is an infrared sensor.

[0015]

The main body case 1 contains a caster 1a and a leg lever 1b on the rear and front sides of the lower portion, respectively. It can move to any location by holding a handle 1c installed on the rear side of the upper portion and by raising the leg lever 1b. Moreover, with the main body case 1, there is a middle partition board 1d supporting the pump 7 and the control box 10, and an upper partition board 1e in that the motor 2 is attached.

[0016]

The motor 2 serves for rotating the carburetor 11, and is attached upward in the center of the upper partition board 1e. On the rotating axis of the motor 2, a rotating base 2a is attached. On the rotating base 2a, there are the covering part 3 and the supporting part 4. The covering part 3 has a hollow, hemispherical shape. On the front side, there is a lengthwise spraying hole 3a. In addition, on the rear side, there is a lengthwise operating hole 3b. The supporting part 4 comprises a U-shaped part and a freely rotating supporting board supported on the U-shaped part with a bearing. On the supporting board, in addition to the carburetor 11 being supported, the tip

of an operating bar 4a extended from the supporting board is projected toward outside from an operating hole 3b.

[0017]

The first tank 5 is arranged in the main body case 1 so that it is freely detachable and attachable, and contains water F1. One end of the liquid supply tubing 6 is inserted into the first tank 5, while the other end is connected to the inlet-port of the carburetor 11. Moreover, the pump 7 is equipped in the middle of the liquid supply tubing 6.

[0018]

The second tank 8 is arranged in the main body case 1 so that it is freely detachable and attachable, and contains liquid disinfectant F2. One end of the liquid absorption tubing 9 is inserted into the second tank 8, while the other end is connected to a pipe-type second nozzle 9a.

[0019]

The carburetor 11 comprises a main body 11d made of metal, including an inlet-port 11a, an outlet-port 11b and an evaporation chamber 11c connected to these parts, an evaporation part 11e made of a sintered metallic material and arranged in the evaporation chamber 11c, a panel-type heater 11f attached on the bottom of the main body 11d, a pipe-type first nozzle 11g connected to the outlet-port 11b, and a temperature sensor 11h consisting of a thermistor and attached to the top of the main body 11d. The temperature sensor 11h is for sensing the temperature of the carburetor. Signal of the sensor is sent to a control circuit 21 described below.

[0020]

The obstructing part 12 is for blocking the spraying nozzle 3a of the covering part 3 from the inside. It consists of a material that has the same curvature as the inside of the covering part 3, and is attached on the supporting part 4. Moreover, a 1st nozzle 11g and a 2nd nozzle 9a are attached on the obstructing part 12. The tip of the 2nd nozzle 9a is arranged in front of the tip of the 1st nozzle 11g so that it intersects perpendicularly with the 1st nozzle 11g.

[0021]

The infrared sensor 13 is for sensing infrared radiation emitted from a human body. It is equipped on the upper front of the main body case 1. The infrared sensor 13 detects the presence or absence of a human body in front of the chemical spraying machine on the basis of the infrared radiation. The signal of the sensor is sent to a control circuit 21 described below.

[0022]

The present Practical Example represents a spraying device comprising the above 1st tank 5, liquid supply tubing 6, electromagnetic pump 7, 2nd tank 8, liquid absorption tubing 9 and carburetor 11 and sprinkling the disinfectant F2. With this spraying device, water F1 is sent to the carburetor 11 in a heated state for evaporation. The steam can be sprayed from the 1st nozzle 11g. By the steam spraying, a negative pressure is generated based in a venturi system at the tip of the 2nd nozzle 9a, and consequently the disinfectant F2 is aspirated. It then collides with the sprayed steam, and both can thus be sprayed and sprinkled as a mixture.

[0023]

Moreover, the spraying can be carried out in a revolving manner by rotating the motor 2 in both directions over a specified range of angle. Moreover, the angle of spraying can be changed by moving the protruding end of the operating bar 4a.

[0024]

Next, the electrical configuration is explained with reference to Figure 3. In this drawing, 21 is a control circuit; 22 is a driving switch; 23 is a time setting device setting the spraying start time and period of spraying time; 24 is a drive circuit for the motor 2; 25 is a drive circuit for the pump 7; 26 is a drive circuit for the heater 11f; and 27 is a drive circuits for a digital display device 27. Moreover, 11h and 13 are the temperature sensor and infrared sensor described previously.

[0025]

The control circuit 21 consists of a well-known CPU and memory that stores a control program related to the spraying. Based on operating signals of the driving switch 22 and time setting device 23 and on detection signals of the temperature sensor and infrared sensor 11f and 13, control signals are delivered to the drive circuits 24 and 27 in accordance with the program.

[0026]

The time setting device 23 has ten keys, set key, reset key, etc. necessary for setting. Time and period of time input with the ten keys are confirmed with the set key. Input errors are cancelled with the reset key. On the display device 27, in addition to the above setting sequence, set spraying start time and period of spraying time are also all displayed. During spraying, the remaining time is displayed.

[0027]

Next, the spraying actuation and control procedure are explained with reference to Figure 4. After the power is turned on, spraying start time T_s and period of spraying time t_s are initiated. "Please input spraying start time and push set. For an input error, please push reset" is shown on the display device 28. According to these procedures, the user inputs the spraying start time T_s using ten keys of the time setting device 23 and then presses the set key to confirm the spraying start time T_s . After setting the time, "Please input period of spraying time and push set. For an input error, please push reset" is shown on the display device 28. According to these procedures, the user inputs period of spraying time t_s using ten keys of the time setting device 23 and then pushes set key to confirm the period of spraying time t_s . After setting the period of time, "If there is no error with the setting, please push run switch and retreat before the spraying start time" is shown on the display device 28. The user confirms the set spraying start time T_s and period of spraying time t_s , and then turns the run switch 22 on, followed by retreat from the spraying area (S1-S3).

[0028]

After turning the run switch 22 on, the system waits until the spraying start time T_s . At the spraying start time T_s , the presence or absence of human body in the spraying area is evaluated on the basis of the detection signal from the infrared sensor 13 (S4, S5).

[0029]

If the absence of human body is detected, the spraying device is operated to start spraying. A timer (t_1) is started (S6, S7). Spraying actuation of the disinfectant F2 is as stated previously and here its explanation is omitted here.

[0030]

During this spraying, the presence and absence of human body in the spraying area is monitored until $t_1 \geq t_s$. If there is no invasion by a 3rd person etc., the operation of the spraying device is continued and is stopped to suspend the spraying when the period of spraying time t_s has passed (S8-S10).

[0031]

If a human body is detected at the above S7 (i.e., there is invasion by a 3rd person, etc. during spraying), actuation of the spraying device is stopped to suspend the spraying. The spraying time t_1 until stopping is subtracted from the originally set period of spraying time t_s . The remaining time is set as the spraying time t_s again, and then a timer (t_2) is started (S11-S13).

During this spraying interruption, the presence or absence of a human body in the spraying area is monitored until $t2 \geq tg1$ ($tg1$ is the limit for the interruption time). If the third person, etc. has retreated and no human body detected any longer, the status is returned to S6 to resume spraying. The spraying is carried out only for the time that remained at the interruption (S14, S15). On the other hand, if the spraying interruption time is over the limit value $tg1$ (e. g. by 1 hr), the reset period of spraying time (remaining time) ts is cancelled (S16).

[0032]

Moreover, if a human body is detected at the above S3 (i.e., there is invasion of a 3rd person, etc. at the spraying start time Ts), spraying initiation is delayed. A timer ($t3$) is started (S17). During this spraying delay, the presence and absence of human body in the spraying area is monitored until $t3 \geq tg2$ ($tg2$ is the limit for the delay time). If the third person, etc. has retreated with no human body detected any longer, the status is returned to S6 to resume spraying (S18, S19). On the other hand, if the spraying delay time is over the limit value $tg2$ (e. g. by 1 hr), the originally set spraying start time Ts and period of spraying time ts are cancelled (S20).

[0033]

Thus, with the above-described chemical spraying machine, even if at the spraying start time Ts the presence of human body is detected by the infrared sensor 13, the start of spraying can be delayed until the absence of human body is detected. Thus, high safety for a third person, etc. who accidentally intrudes into the spraying area at the spraying start time can be assured. Moreover, after retreat of the third person, etc., the planned spraying of disinfectant can be carried out.

[0034]

Moreover, forcible execution of disinfectant spraying is not carried out in a situation where a spraying schedule is not adequately communicated or is forgotten, since the spraying start time Ts and the period of spraying time ts that have been set up when the above-mentioned time delay is long and exceeds the threshold value $tg2$ can be cancelled.

[0035]

Furthermore, since spraying can be interrupted if the presence of a human body is detected by the infrared sensor 13, until the detection of the absence of a human body, excessive inhalation of disinfectant by the third person, etc., who intrudes during spraying accidentally, can be prevented. Moreover, after retreat of the third person, etc., the disinfectant spraying can be

carried out only for the time period that remained at the interruption. Thus, the expected effect can be achieved.

[0036]

Furthermore, if the above spraying interruption time is long and exceeds the limit t_{g2} , the period of spraying time t_s can be cancelled. Thus, disinfectant spraying is not resumed in a situation where a spraying schedule is not adequately communicated or is forgotten.

[0037]

In addition, although in the above Practical Example, the chemical spraying machine with a two-fluid type constitution was described, the present invention can be applied to other spraying machines. Moreover, the drugs that may be sprayed include insecticides, agricultural chemicals, etc., in addition to disinfectants. Moreover, the drugs sprayed are not limited to those harmful to the human body. For spraying deodorants, perfumes, etc. that are not harmful to human body, it is also advantageous that any potential concerns would be ruled out.

[0038]

[Effect of the Invention]

As described above, with the chemical spraying machine under Claim 1, even if the presence of human body is detected at the spraying start time by the human body detection means, the start of the spraying can be delayed until the absence of human body is detected. Thus, high safety for a third person, etc., who accidentally intrudes into the spraying area at the spraying start time, can be assured. Moreover, after retreat of the third person, etc., the planned spraying of disinfectant can be carried out.

[0039]

With the chemical spraying machine under Claim 2, spraying can be interrupted if the presence of human body is detected by the human body detection means until the absence of human body is detected. Thus, excessive inhalation of disinfectant by the third person, etc., who intrudes during spraying accidentally, can be prevented. Moreover, after retreat of the third person, etc., the disinfectant spraying can be carried out only for the remaining time at the interruption. Thus, the expected effect can be achieved.

[0040]

With the chemical spraying machine under Claim 3, if the above delay time is long and exceeds a specific value, the set spraying start time and period of spraying time can be cancelled.

Thus, forcible execution of disinfectant spraying is not carried out in a situation where a spraying schedule is not adequately communicated or is forgotten.

[0041]

With the chemical spraying machine under Claim 4, if the above spraying interruption time is long and exceeds a specific value, the period of spraying time can be cancelled. Thus, disinfectant spraying is not resumed in a situation where a spraying schedule is not adequately communicated or is forgotten.

[Brief Description of the Figures]

[Figure 1] A cross-sectional schematic diagram of the chemical spraying machine

[Figure 2] A constitutional diagram of the spraying device

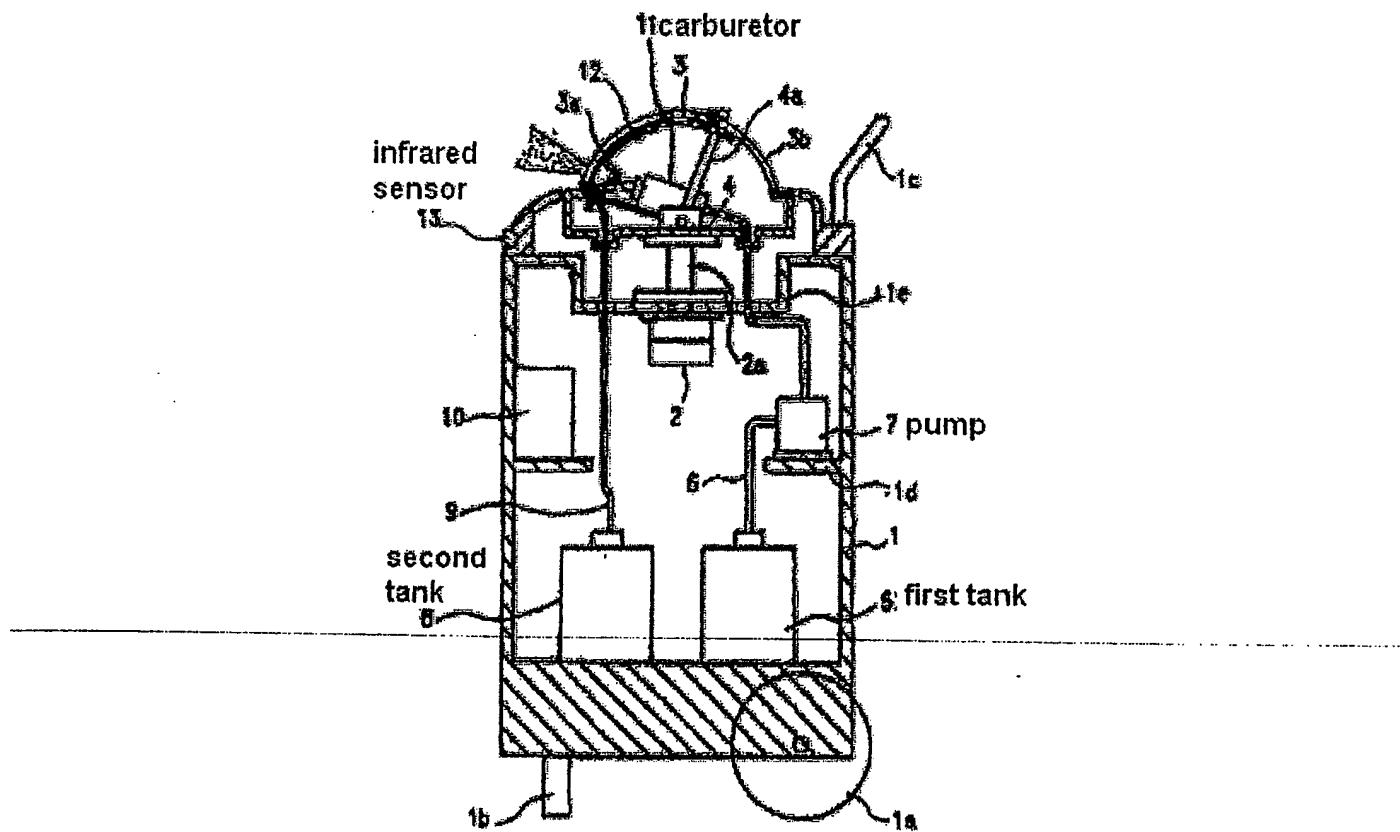
[Figure 3] A block diagram of the electric system circuit

[Figure 4] The flow chart of the spraying control

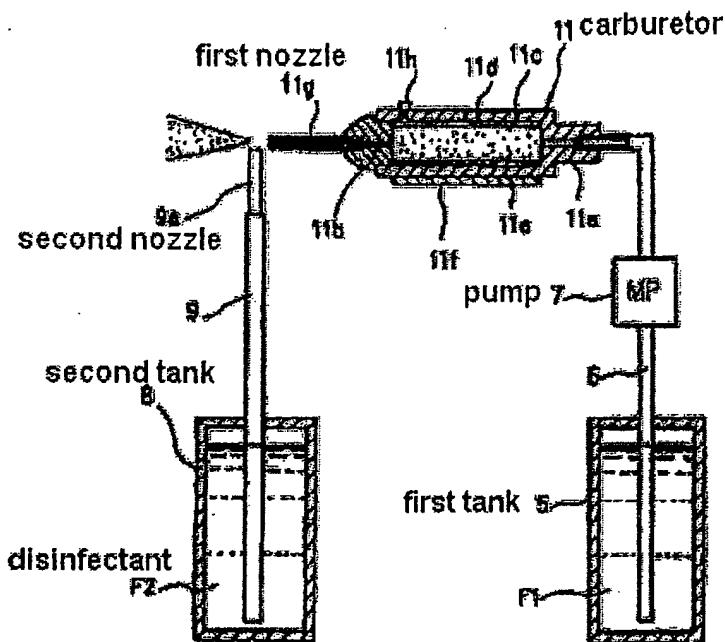
[Description of the Notations]

5 --- first tank, 7 --- pump, 8 --- second tank, 9a --- 2nd nozzle, 11 -- carburetor, 11f --- heater, 11g --- 1st nozzle, 13 --- infrared sensor, 21 --- control circuit.

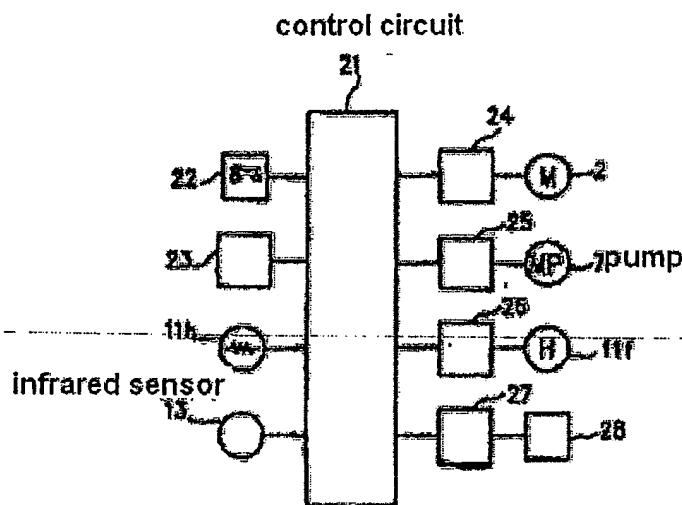
[Figure 1]



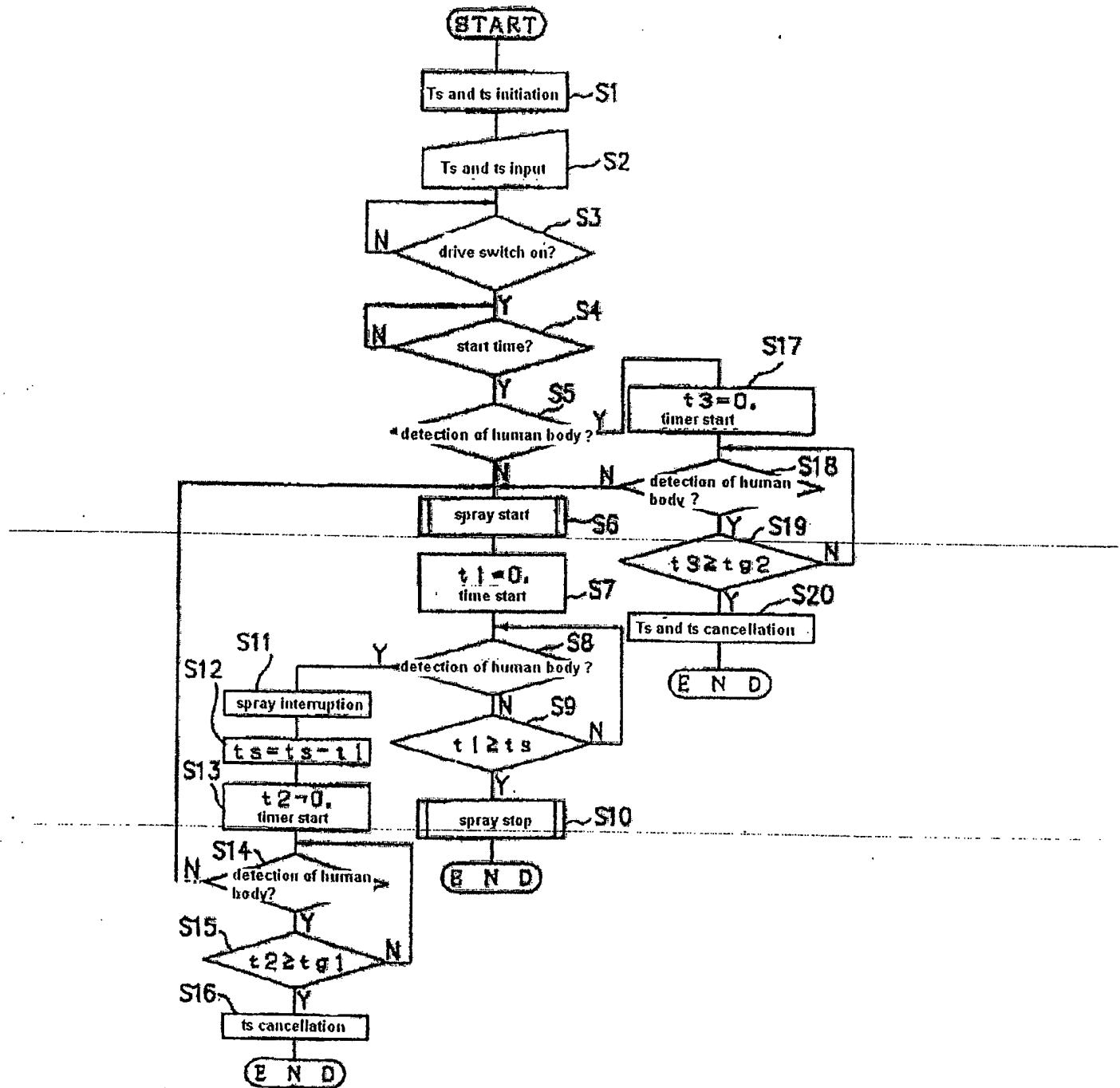
[Figure 2]



[Figure 3]



[Figure 4]



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